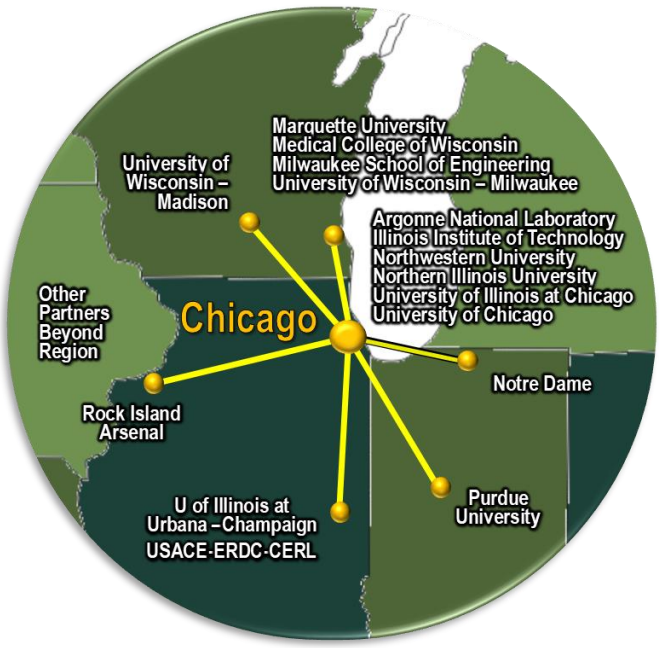
ARL CENTRAL

MARCH 2019

Army Research Laboratory (ARL) Central
1452 E 53rd Street, 2nd floor (Polsky, U Chicago)
Chicago, IL 60615

VISION

The vision of ARL Central is to accelerate discovery, innovation, and transition of science & technology to the Army through forging strategic regional partnerships via the Army's Open Campus Business Model



GOALS

- Establish regional campuses to jointly solve Army technology needs
- Establish close ties with academia, laboratories, start-ups and established companies
- Access large pool of subject matter experts from academic and non-academic partners
- Capitalize on strong academic institutions and graduates within region

RESEARCH THRUSTS

Propulsion and Power, Impact Physics & Energetic Materials, Materials Design, Sensors & IOT, Data Science

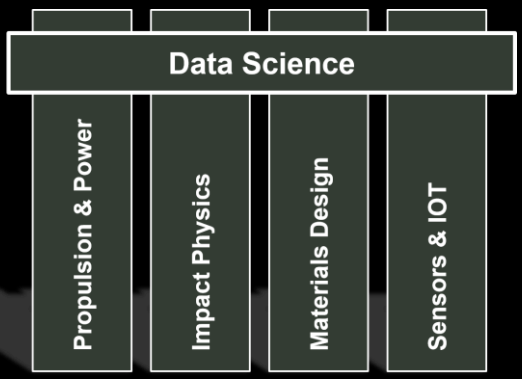
https://www.arl.army.mil/opencampus/

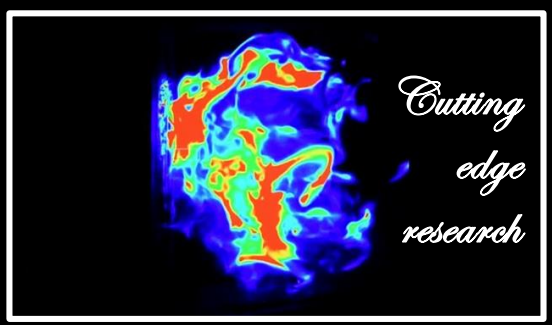
For further information, contact:
Mark Tschopp
Regional Lead, ARL Central
US Army Research Laboratory
ARLCentral@arl.army.mil

ARL-C RESEARCHERS

32

Government Civilians
Joint Faculty Appointments
Postdoctoral Researchers
Graduate Student Researchers
ARL Central Extended Researchers





U.S.ARMY

DEVCOM ARMY RESEARCH LABORATORY

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Internet of Battlefield Things CRA tackles future Army network needs for multi-domain operations

The CCDC ARL held its biannual program plan meeting for the Internet of Battlefield Things, or IoBT collaborative research alliance at Georgetown University, March 5-6. The event brought together researchers and experts from ARL, the CRA lead performer (University of Illinois at Urbana-Champaign), and CRA members (UMass, UCLA, USC, Georgetown, SRI International). The meeting kicked-off with a keynote talk by Col. Nora Marcos, Network Cross-Functional Team Chief of Staff, who outlined the progress in the Network Modernization Priority and future operational challenges that are being addressed by the IOBT CRA. Program reviews and research plans were presented by ARL and its alliance partners. The IoBT BPP meeting concluded with a plenary lecture by Lt. Col. David Spencer, Chief, Future Studies Branch, Future Warfare Division, Futures and Concepts Center, on the operational capabilities required for multi-domain operations. This meeting set the stage for the upcoming two-year research plan, with an emphasis on MDO challenges for IoBT technologies. Additionally commitments were made to tighten the engagement between the CRA researchers and the Network CFT. Further Spencer agreed to initiate engagement with U.S. Army Futures and Concepts Center to develop relevant scenarios to provide research context and focus.

Non-Hermitian operators in mathematical structures may hold key for future Army technologies (*ARO Workshop)*

Subject matter experts from academia and the CCDC ARL convened at University of Chicago's Polsky Center for an Army Research Office workshop aimed at fostering another breakthrough in physics utilizing recent advances in mathematics, Feb. 7. Experimental work in 2008 demonstrated that the mathematics of topology was at play in the band structure of readily accessible materials, resulting in novel physical phenomena such as the protected surface states of a topological insulator. This breakthrough exploded on the scene becoming the most active subfield of condensed matter physics and spilling into optics, atomic physics, electronics and mechanical engineering, providing numerous opportunities for unexpected solutions to many Army problems ranging from energy efficient electronics to armor. Based on this, this workshop posed the question: what other mathematical structures could have an equal impact on physics providing additional opportunities for revolutionary Army technologies? One of the ideas repeatedly emerging at the workshop was that of non-Hermitian operators, a concept that has already received some attention in the optics community. Non-Hermitian operators allow for complex valued states and holds promise for opportunities ranging from unique control of photonic systems to quantum information. The pursuit of opportunities of this nature may transition to the development of technologies such as ultra-sensitive sensors in support of the U.S. Army Functional Concept for Intelligence.

POC: Dr. Marc Ulrich, ARL-ARO Physics Division

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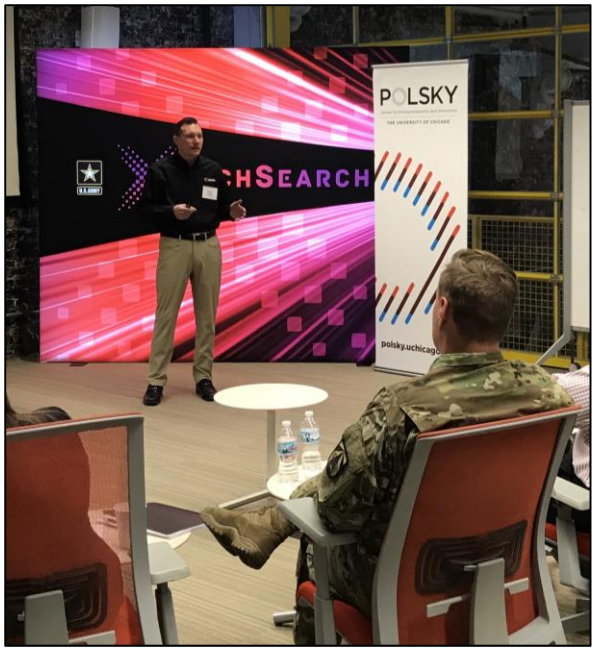
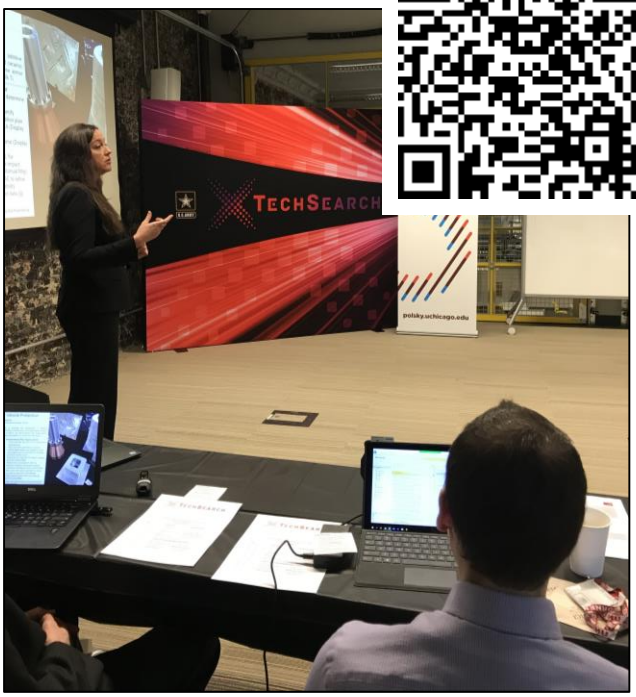
Army takes xTechSearch 2.0 to Chicago



ARL Central hosted one of the xTechSearch 2.0 technology pitch events (Phase II) at University of Chicago's Polsky Center for Entrepreneurship and Innovation, February 28, 2019. Multiple companies were invited to complete a venture-style pitch to a panel of Army subject matter experts around the country in the area of Next Generation Combat Vehicle technologies and were awarded $4,000 prizes for making it through the Phase I white paper stage. Four companies from the Chicago pitch event were selected as semifinalists for AUSA Innovators' Corner and received a $10,000 prize. Two of these companies were selected as finalists at AUSA, awarded $120,000 in prize money, and have the opportunity to demonstrate their technology at the AUSA fall meeting.



From Chicago technology pitch:

- Advanced Hydrogen Technologies Corporation
- Great Lakes Sound and Vibration, Inc. (above)
- MELD Manufacturing Corporation (lower left)
- Sphere Brake Defense, LLC (upper left)

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Internet of Battlefield Things (IoBT) Collaborative Research Alliance (CRA)

Research on Evolving Intelligent Goal-driven Networks (IoBT REIGN)

IoBT REIGN

https://iobt.illinois.edu/

Adaptive Resources: Making Network Services Adaptive

If there is one element that distinguishes an Internet of Things, or IoT technology for the battlefield, it is that the environment in which this technology operates will be much less predictable and more hostile. A recently funded Collaborative Research Alliance by the Army Research Laboratory addresses this challenge. Led by the University of Illinois in collaboration with ARL, the Internet of Battlefield Things, or IoBT CRA develops theoretical foundations, models and methods for adaptation and self-awareness of distributed assets that together form a seamless "combat cloud" supporting multi-domain operations. In biological systems, reflex theory states that complex behavior can be attained (and thus explained) through the combined action of individual reflexes that have been chained together. A parallel theory is being developed for IoBT systems to offer foundations, models and methods for adaptive, autonomic and self-aware behavior despite distribution, scale, dynamics, heterogeneity, resource constraints and presence of adversaries.

Intelligent Services: Designing for Intelligent Battlefields

Another deviation from commercial IoT research lies in the underlying assumptions on repeatability of service usage patterns. An IoT service in a smart home may be designed to learn user preferences over time and adapt accordingly. Adversaries in future conflict scenarios will not follow such predictable patterns, which motivates a second major thrust of the IoBT CRA. An IoBT must learn from patterns that are poorly observable, highly dynamic and purposely manipulated to deceive the learner. Machine resources needed for learning may be disrupted, rendered unreachable, jammed or otherwise interfered with. Learning must occur on much smaller time scales due to a fast operating tempo and must extrapolate from fewer data points, while offering assurances in results. The work also addresses information gathering in adversarial settings, large-scale distributed processing and ISR functionality, analytic services through distributed and adversarial learning and decision support services. This research area is the cognitive arm of IoBTs.

Composition: Composing Services to (Mission) Order

Finally, developing adaptive intelligent "combat clouds" or IoBTs is necessary but not sufficient. It remains to integrate the adaptive and intelligent machines with the mission command paradigm. Given a high-level mission order, how should one decide what individual components should do? In fact, how to decide what components are needed? Future missions will exploit IoBTs made of myriads of blue/military, red/adversary and gray/citizen nodes, with a wide range of capabilities: from tiny occupancy sensors to drones with three dimensional Radar and LiDar sensors; from small on-board compute devices to powerful edge clouds with GPUs; and from single-function actuators (e.g., munitions) to humans with powerful (albeit biased) perception, cognition and action capabilities. A key research challenge is to construct, at short timescales, IoBTs tailored to satisfy mission needs. This research area aims to develop methods and fundamental limits underlying the recruitment and composition of IoBT resources into composite assets with sufficient capacities to satisfy mission needs and constraints.

ARL IoBT CRA Participants: UIUC (lead), UMass, UCLA, USC, Georgetown, SRI International

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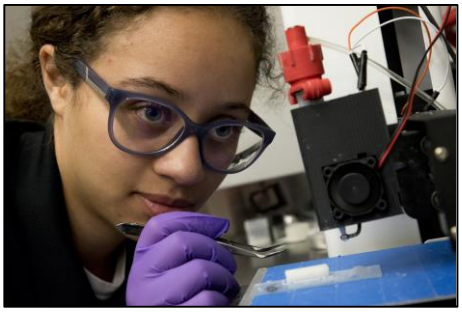
3-D Printing… propellants?

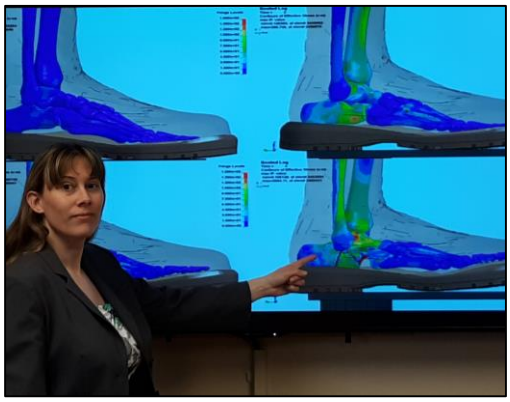
Additive manufacturing or "3-D printing" has been shown to be useful for a variety of materials such as metals and plastics. But what about propellants? Researchers I. Emre Gunduz (Naval Postgraduate School), Jeff Rhoads and Steve Son (Purdue University) have teamed up with Jennifer Ciezak-Jenkins and Sarah Isert (CCDC ARL) to explore using AM technologies to improve the environmental impact of manufacturing gun propellants. Standard AM methods don't work well for propellant – high viscosities make pushing it through nozzles difficult, heating it to help it flow can make the propellant ignite and using solvents to lower viscosity leads to adverse environmental impacts. Purdue University has developed a vibrating nozzle that, by reducing friction on the walls, allows highly viscous material to flow easily through the nozzle, enabling very fine features to be printed without heating the propellant, making holes or using large amounts of solvent. The ability to 3-D print propellants could lead to large advances in the environmental impact of propellant processing and overall Army readiness.



Monique McClain, doctoral candidate at Purdue, examines a 3-D printed propellant grain

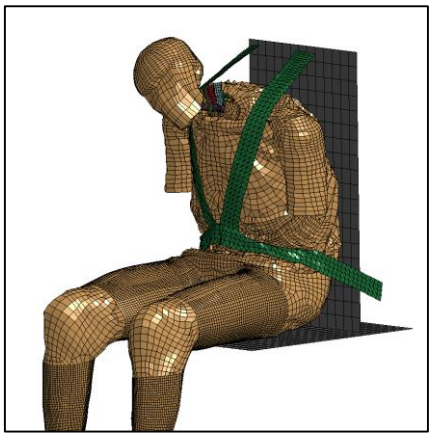
Biomechanics for Soldier Protection I

The Neuroscience Department of the Medical College of Wisconsin at the Milwaukee VA Medical Center and CCDC ARL (Dr. Carolyn Hampton, right) are collaborating to understand and prevent musculoskeletal injuries in Soldiers. Combining MCW's experimental biomechanics and medical imaging data with ARL's impact physics and computational simulation knowledge allows ARL to rapidly respond to novel emerging threats. Current research is focused on mitigating lower leg accelerative injuries caused by underbody blast scenarios. Lower extremity biomechanics data guide the development of a human body finite element model. The model's injury predictions correlate with known injury patterns while also providing non-invasive measures of the internal forces and stresses. This human body model can be used to study injury biomechanics in different body regions or evaluate prospective designs for future protective equipment.



Biomechanics for Soldier Protection II

Wayne State University and CCDC ARL (Soldier Protection Sciences Branch and Blast Protection Branch) are collaborating on finite element human body modeling in the areas of lumbar spine and lower leg accelerative loading and thoracic behind armor blunt impact research. The WSU human body model was fitted with a new spine designed for biofidelity under +Gz accelerative loading. The model's lower leg and thoracic meshes and material properties have been refined to improve the model's response to under body blast floor loading and high-rate behind armor blunt impact. The aim of the research is to develop a biofidelic finite element human body model surrogate suitable for studying combat-related injury mechanisms and a design tool that expedites injury mitigating safety system development using modeling and simulation. The computational efforts are being conducted by doctoral student Alan Goertz (ARL researcher), who is studying impact biomechanics at WSU under Dr. King Yang and Dr. David Viano.



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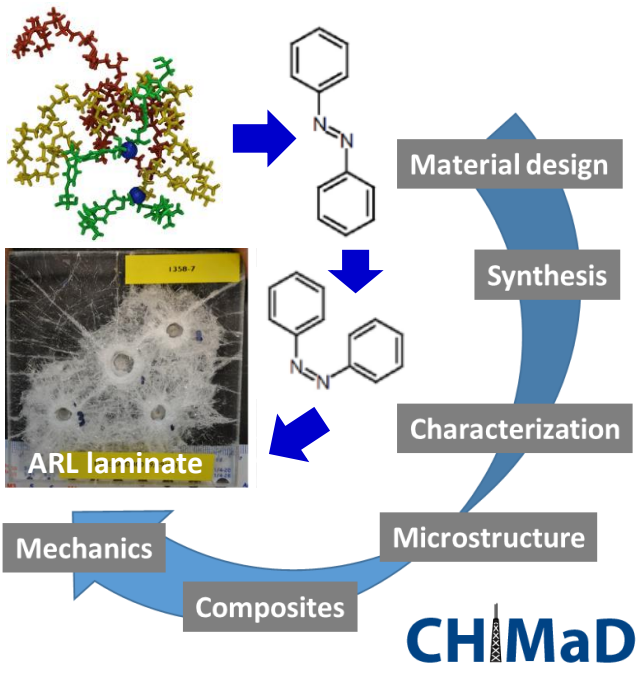
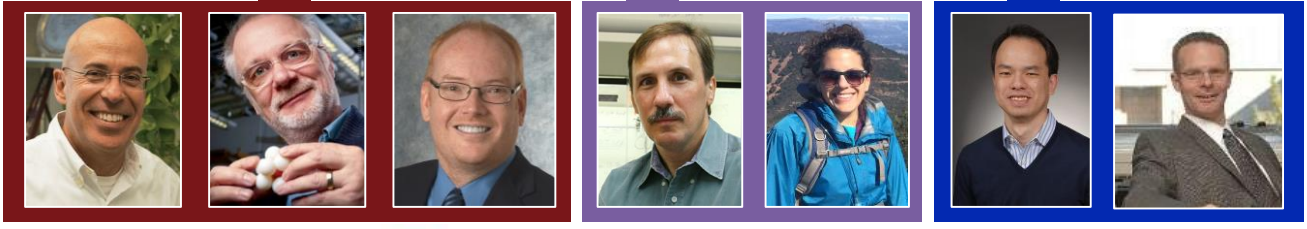
Materials Design: Responsive Polymer Composites

CCDC ARL is collaborating with the University of Chicago, Northwestern University and the National Institute of Standards and Technology to develop dynamically responsive polymers and composites. Responsive polymers have historically focused on soft systems such as elastomers and gels, which exhibit slow response times. However, emerging Army needs in unmanned vehicles, protective systems and weapons necessitate response times as fast as micro-seconds, in rigid materials, with the use of low power stimuli. The research is coordinated across several areas including: identifying temperature and rate dependent deformation mechanisms in rigid crosslinked polymers; developing structural resins with enhanced ductility; integrating responsive chemical moieties into Army relevant resins; and using this information, collectively, to design dynamically responsive rigid networks and composites. The long term goal is to manufacture composite systems that exhibit rapid and potentially reversible changes in mechanical response such as stiffness, damping, deformation processes, failure mechanisms, and/or shape with low power excitation such as optical, electric, or magnetic fields, enabling higher performing and/or lighter materials for Soldier/vehicle protection and lethality systems.



Prof. Heinrich Jaeger
Prof. Juan de Pablo
Prof. Stuart Rowan
Dr. Kenneth Shull
Dr. Caroline Szczepanski
Dr. Edwin Chan
Dr. Christopher Soles



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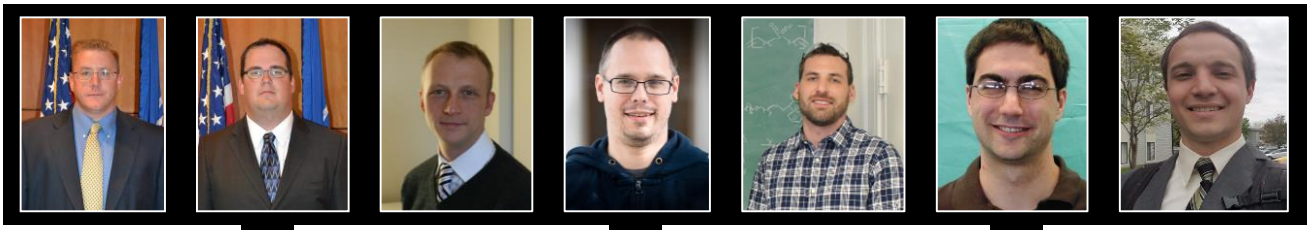
NIST National Institute of Standards and Technology U.S. Department of Commerce



Dr. Joseph Lenhart (POC)
Dr. Randy Mrozek
Dr. Timothy Sirk
Dr. Berend Rinderspacher
Dr. Michael Bell
Dr. Michael Salerno
Dr. Joseph Dennis

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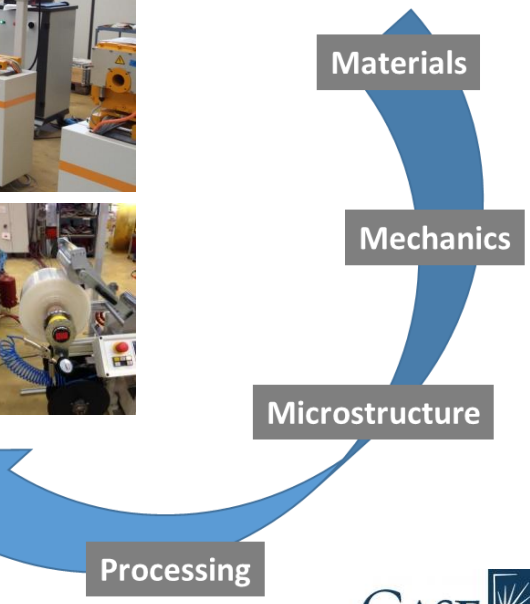
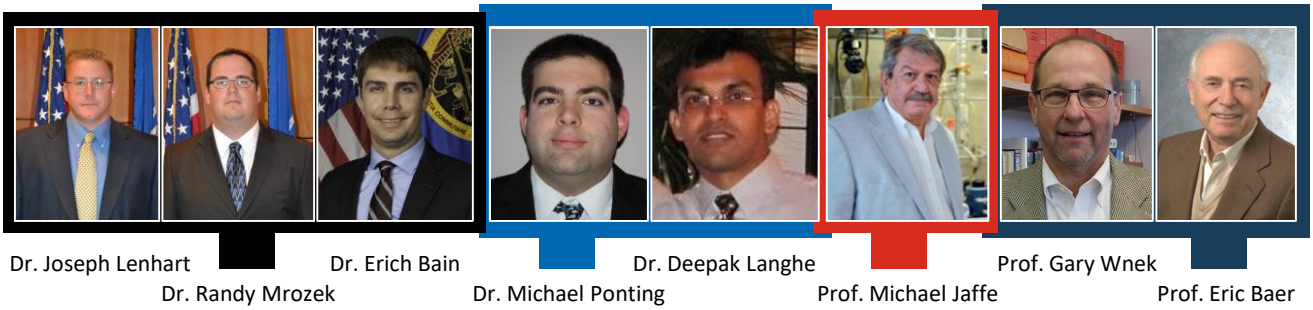
Materials Design: Novel Multi-Layer Composite Processing

CCDC ARL is collaborating with small business Polymer Plus, Case Western Reserve University and New Jersey Institute of Technology to develop high performance composites. The innovative research exploits multi-layer film processing to manufacture polymeric tapes with highly oriented and organized microstructure, enabling films with high tenacity and toughness. These tapes can be consolidated into multi-layer composite structures with potential applications for next generation protection systems and weapons. The combined use of high density polyethylene with multilayer film processing creates layers on the order of 30-50 nanometers with numerous interfaces, enabling a high performing polymer material that can be more easily processed (i.e., lower cost) and is lighter than current polymeric protective materials.

POC: Joseph L. Lenhart
(joseph.l.lenhart.civ@mail.mil)



Bringing unique polymer processing capability at Polymer Plus and subject matter experts together to design ***high performance polymer tapes***, composed of multilayer high density polyethylene, for Army applications



Dr. Joseph Lenhart, Dr. Randy Mrozek, Dr. Erich Bain, Dr. Michael Ponting, Dr. Deepak Langhe, Prof. Michael Jaffe, Prof. Gary Wnek, Prof. Eric Baer

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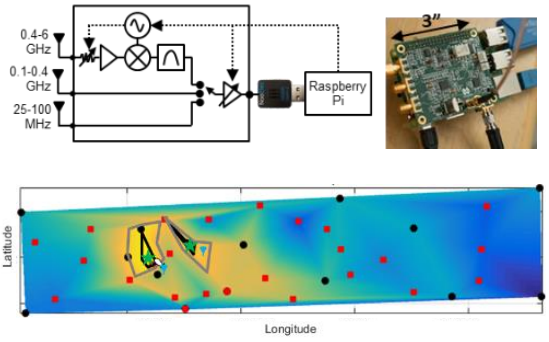
Distributed Spectrum Sensing with Collaborative and Responsive Nodes

CCDC ARL and the University of Notre Dame are collaboratively investigating how low-cost reconfigurable radio frequency (RF) sensors can enhance situational understanding in congested and contested electromagnetic environments. The project has generated algorithms to enhance performance of a "virtual" sensor comprised of multiple individual low-cost sensors, developed low-cost RF sensor hardware and created a web-based software architecture for command and control. The sensors, algorithms and software have been used in multiple applied research field experiments (at Notre Dame, an OSD event and a NATO experiment in Italy). Future work includes developing algorithms to detect, identify and classify complex signals with one or more low-cost sensors.

POC: Charles Dietlein (ARL), Jonathan Chisum (Notre Dame)



ARL, Notre Dame Meet to Target Future Collaborative Research for Electronics, Protection, and Maneuver

CCDC ARL and Notre Dame University held a workshop on the campus of Notre Dame to communicate Army needs and ARL's research programs, discuss Army Research Office's extramural basic research opportunities and discuss how to collaboratively partner through the Army Open Campus business model and ARL Central, March 6. The workshop included targeted discussions of how to work together in the areas of electronic and quantum materials, polymer materials and energetic materials, with subsequent discussions held regarding the intersection of ARL's foundational essential research programs (ERPs) for Electronic Warfare in Multi-Domain Operations (FREEDOM) and Versatile Tactical Power and Propulsion (VICTOR) with Notre Dame's Wireless Institute and Turbomachinery Laboratory.

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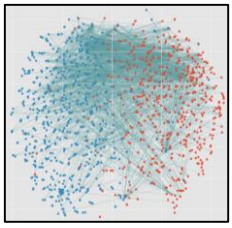
Improving Graph Neural Networks by Calibrating Collective Classification



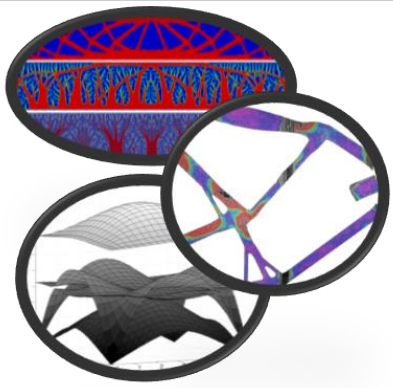
How do we improve classification within machine learning models? Relational models for classification, specifically graph neural networks, permeate all aspects of deep learning these days, from scene understanding in UAVs and self-driving cars to sensor fusion to reinforcement learning. Unfortunately, relational models are not guaranteed to be calibrated. For instance, while the inference model classifies the input LIDAR sensor data as a civilian car with a 0.80 probability, the actual probability could be much lower (or higher). Fortunately, a car is rarely alone in a scene; other objects around the car can help with the classification. Unfortunately, to add to this, researchers Dr. Bruno Riberio (Purdue University) and Dr. Brian Jalaian (ARL) have found empirical evidence that these graph neural networks are often highly uncalibrated. To overcome this technical challenge, they have developed a novel deep learning technique termed collective classification, which combines graph neural networks with classic Markov Chain Monte Carlo techniques and meta learning to achieve the joint (collective) calibration of all elements in a scene. Computational results have already shown reasonable gains in calibration and the ARL-Purdue team is working towards fully calibrated models of entire scenes. The significance of this research is AI in future Army applications requires ML models with a sufficient level of confidence in the fidelity of feature/object classification, which provide a precise, reliable and quantifiable measure of "uncertainty" in addition to merely "accurate" output for autonomous Army complex systems. Unlike AI/ML in commercial application counterparts, the "predictive uncertainty quantification and confidence calibration" is the core of the Army AI/ML applications, which operate in the presence of adversarial perturbation and extreme sparse data-driven environments.

IoT: Smart Cities and Installations Workshop

An invitation-only “IoT: Smart Cities and Installations” workshop is occurring on ***June 6-7, 2019*** at the University of Chicago. This 1.5-day workshop is organized by the U.S. Army Combat Capabilities Development Command, Army Research Laboratory (ARL), Battlefield Information Processing Branch in collaboration with Argonne National Laboratory (ANL), University of Illinois at Urbana–Champaign (UIUC), University of Chicago, and the Center for Data and Computing (CDAC). Workshop topics will be selected from the following focus areas: smart cities/campuses/buildings, IoT, Internet of Battlefield Things (IoBT), gray zone warfare, common operating picture, sensor networks, data information exchange, Command, Control, Communication, and Intelligence (C3I), Artificial Intelligence/Machine Learning, and data analytics. The goal of the workshop is to identify collaboration opportunities focusing on these topics; to identify challenges and technical gaps; and to identify existing and emerging potential solutions.

Interested in future IOT & smart city events? Contact:
Adrienne Raglin (adrienne.j.raglin.civ@mail.mil), Heather Zheng (htzheng@cs.uchicago.edu), or Julia Lane (jlane2@uchicago.edu)

Postdoctoral Researcher Position



ARL’s Design Optimization Team in the Weapons and Materials Research Directorate is seeking a postdoctoral researcher to perform fundamental and applied research in the areas of design, optimization and/or physics-based models. Help design the future Army! Specific research opportunities include, but are not limited to: Topology optimization · Heuristic and gradient-based optimization · Computational geometric methods · Multiscale modeling of material microstructures · Multiphysics modeling of fields in solid material · High-dimensional design and optimization · Large-scale finite element and other computational solvers

Interested? Contact ARLCentral@arl.army.mil

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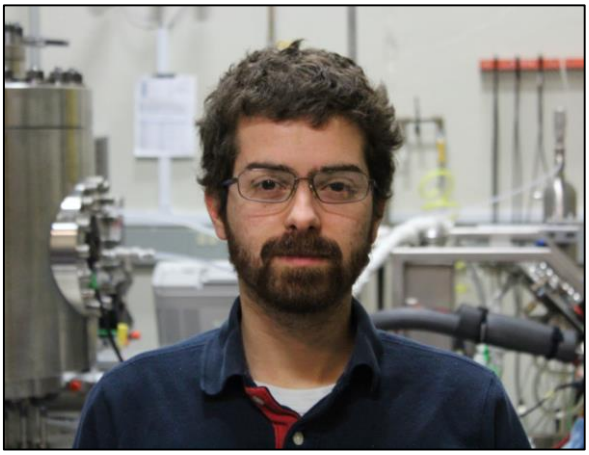
Dr. Constandinos Mitsingas, ARL



Dr. Constandinos Mitsingas is a mechanical engineer working for the Vehicle Technology Directorate within the Army Research Laboratory at Aberdeen Proving Ground, Maryland. He is a graduate of the University of Illinois at Urbana-Champaign combustion research program, where he used laser diagnostic tools to study flame interactions in engine environments. During his doctorate studies he worked closely with the U.S. Army Corps of Engineers (ERDC-CERL) and ARL Central, allowing him to pursue his research interests after graduation as a full-time government employee at ARL. He currently stationed at APG and is supporting the ARL Multi-fuel Capable Hybrid Electric Propulsion program in developing next generation Future Vertical Lift systems.

Dr. Kevin Hart, MSOE

Dr. Kevin Hart is an assistant professor of Mechanical Engineering at the Milwaukee School of Engineering in Milwaukee, Wisconsin. Hart received his bachelor's in Engineering Mechanics and Astronautics from the University of Wisconsin—Madison, and his master's and doctorate in Aerospace Engineering from the University of Illinois in Urbana-Champaign. Hart has collaborated with ARL in many capacities for the past 10 years. As a graduate student at the University of Illinois in Urbana-Champaign, he collaborated with ARL scientists to investigate damage tolerant, self-healing fiber-reinforced composite materials for Soldier protection. After receiving his doctorate, Hart was an ARL post-doctoral research scientist and was later appointed as an ARL staff scientist, developing novel materials to improve the fracture toughness of additively manufactured polymers. He has co-authored 10 journal publications and one patent alongside ARL scientists and continues to collaborate with ARL to commercialize technologies developed over the past decade in the area of advanced materials and additive manufacturing.

Andre Magill, ARL

Andre Magill is an electrical engineer for General Technical Services, LLC at the ARL Adelphi Laboratory Center in Adelphi, Maryland, working with the Electronic Warfare Branch within the Sensors and Electronic Devices Directorate at ARL. The EW branch performs research related to electronic support (sensing, detection, classification), electronic attack, and electronic protection. Some of Magill's current projects include transmitter/receiver architecture fingerprinting, distributed sensor networks, and radar simulation and analysis. While an undergrad at Notre Dame, Magill and his senior design team were part of the ARL—Notre Dame Cooperative Agreement for distributed sensing and built a wirelessly controllable wideband analog power detector sensor. He graduated with his BSEE in May 2018, Andre plans to return to school for his master's in EE in the near future.

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ARL-C Seminar Series

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Dr. Charles A. Kamhoua

ARL-CISD, Network Security Branch

The seminar "Game theoretic modeling of cyber deception in the Internet of Battlefield Things" was given at Purdue's Center for Education and Research in Information Assurance and Security. The talk focused on the role of modeling cyber deception as a complex game where the cyber defense strategy is to stop the cyber attack early in the cyber kill chain through monitoring its actions, hiding information, and manipulating information that the cyber attacker perceives, thereby preventing the subsequent more dangerous phases of the well-known cyber kill chain.

Dr. Andy Gaynor

ARL-WMRD, Materials Response and Design Branch

The seminar "Design at the Point of Need" was given at the University of Illinois at Chicago on March 15. The talk focused on the intersection of topology optimization with additive manufacturing, providing not only manufacturing capability at the point of need, but also design at the point of need—incorporating geometric constraints and materials/manufacturing choices to generate print-ready designs.

Dr. Carolyn Hampton

ARL-WMRD, Soldier Protection Sciences Branch

"Finite Element Modeling of Human Lower Leg Impacts: Development and Applications," was given for the Biomedical Engineering Department, a joint program between the Medical College of Wisconsin and Marquette University, on Feb. 22. The talk described the development of a lower leg finite element model derived from medical images and validated against cadaveric experimental data to mitigate and prevent Soldier injuries.

ARL Central Seminar Series

Interested in learning more about the current challenges of the Army in your area and how our programs are actively working towards knowledge products and outcomes that impact future Army capability?

Interested in learning more about the Army Research Laboratory and ARL Central?

Interested in learning about career opportunities and careers in DOD laboratories?

Or interested in giving a seminar to show us how your research can impact the Army's Modernization Priorities or how it can impact our mission programs?

Not sure where to start? Let's start the discussion!

Contact:
Dr. Mark Tschopp, ARL Central
arlcentral@arl.army.mil

ARL-C Research Vision

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Research Areas

- *Propulsion and Power*
- *Impact Physics*
- *Materials Design*
- *Sensors & IOT*
- *Data Science*

What are the ARL Central Research Thrusts?

The ARL-C Research Vision is to improve ARL's research portfolio by capitalizing on research expertise and unique capabilities within the region through establishing partnerships with regional academic campuses, industry and other government laboratories/agencies. These research areas are based on newly-developed and existing collaborations with partners in the Midwest. These research areas will evolve over time as research needs/partnerships change. These efforts are aligned with a number of the Army Modernization Priorities and Cross-Functional Teams, slated to deliver the next set of capabilities beyond the current state of the art.

The ***Propulsion and Power*** research thrust aims to deliver power and energy solutions for both the Soldier and for manned/unmanned vehicle platforms. Initial efforts are collaborating to support multi-fuel capable hybrid-electric propulsion systems for unmanned aircraft systems (Center for UAS Propulsion), alternate power sources (thermophotovoltaics, isomer power sources, catalysis, etc.), batteries, and electric/hybrid-electric technologies.

The ***Impact Physics*** research thrust aims to deliver protection and lethality capabilities for the Soldier, vehicle platforms and weapon systems. Initial efforts are collaborating with Argonne's Advanced Photon Source and Dynamic Compression Sector to understand the physics of failure in protection materials, to quantify the effects of impact on the human body (biomechanics), and to develop better energetic materials, energetics characterization, and energetics performance through both modeling and experimentation.

The ***Materials Design*** research thrust aims to deliver advanced material and manufacturing solutions into systems, devices and platforms in an accelerated design cycle using computational models intimately coupled with experiments. Initial efforts are collaborating to intelligently design stimuli-responsive polymer materials for Soldier protection, to synthesize multilayer polymer films for protection, to design metamaterial architectures to withstand shock loading, to additively manufacture materials (e.g, metals, polymers, energetic materials), to better design quantum/electronic materials and to design better materials and coatings for various Army platforms.

The ***Sensors & IOT*** research thrust aims to deliver increased situational awareness of the battlefield to the Army, enabling better protection and attack capabilities while supplying information and intelligence from a connected network for command and control in multi-domain operations. The Internet of Battlefield Things, or IoBT collaborative research alliance is a big thrust within the region, as are complementary efforts in IoT for smart cities/installations, electric/magnetic field sensing, distributed collaborative RF sensing for electronic warfare and wearable sensors—all used with advanced computing or computing-at-the-edge to protect and understand attacks on networks.

The ***Data Science*** research thrust is a cross-cutting area that aims to deliver knowledge through applying and understanding the full life cycle of data from data collection/curation to machine learning/artificial intelligence to decisions/analytics under uncertainty. Initial efforts will tie into the IOBT collaborative research alliance, as well as advancing computer architectures for machine learning/artificial intelligence, adversarial machine learning, and data science for high performance computing to edge computing—all of which is used to transform data into actionable knowledge and intelligence to make decisions.

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Center for UAS Propulsion (CUP) Industry-Academia Connection Days

Please join us on the first CUP Industry-Academia Connection Days at University of Illinois at Chicago on May 1-2. CUP leads research focused on discovery, innovation and transition of Unmanned Aircraft System propulsion technologies to enable unmatched, enduring power for maneuver and mobility. The aim of the center is to address U.S. Army needs for current and future advances in UAS propulsion systems in the following four areas:

- ***Reliability:*** reliable operational cycles over extended periods
- ***Payload:*** increase power density to facilitate additional electronics, cargo and sensor packages
- ***Signatures:*** decrease in detection by opposing parties
- ***Range:*** increased operational range

The goal of the Industry-Academia Connection Days is to facilitate collaboration in UAS power and propulsion between industry, academia and government agencies. During this event, industry leaders will present technical challenges in the following UAS focused areas:

- Small gas turbine engines
- Non-conventional small engines
- Hybrid-electric applications
- Energy storage technologies to enable lighter weight, higher power and energy
- Power and thermal management technologies

Event Information (Save the Date)

Date: May 1-2, 2019
Location: University of Illinois at Chicago,
Student Center East, Cardinal Room
750 South Halsted Street, Chicago, IL 60607
No Registration Fee
Registration Website: http://tinyurl.com/y6e7m9rc
RSVP: Contact POCs below to reserve your available space and for more information

* Coffee and Light Refreshments provided courtesy of UIC

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CUP Website
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ARL CENTRAL

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xTechSearch 2.0 Semi-finalists

Advanced Hydrogen Technologies Corporation

Great Lakes Sound and Vibration, Inc.

Sphere Brake Defense, LLC

xTechSearch 2.0 Finalists (12): MELD Manufacturing and Great Lakes Sound and Vibration were selected to move to next round and will receive $120,000 to demonstrate their technology at 2019 AUSA Annual Meeting. Joining them as a finalist is local small business AKHAN Semiconductor, Inc. from Gurnee, Illlinois and other small businesses: Antimicrobial Materials; Cogitari, Inc.; Lumineye; Novaa Ltd.; Olifant Medical; Spark Thermionics, Inc.; United Aircraft Technologies; Valley Tech Systems; and Vidrovr Inc.

Adranos, Inc. wins xTechSearch 1.0

Adranos, Inc., a Purdue University-affiliated company out of West Lafayette, Indiana, took the top prize for their high-performance, clean solid propellant for long-range missile and space launch systems. xTechSearch mirrors entrepreneurial pitch competitions where aspiring entrepreneurs make innovative proposals to panels of investors, who then choose whether to invest as business partners. In xTechSearch, companies are able to pitch novel technology solutions directly to panels of judges from Army leadership. Small businesses submitted more than 350 white papers for the first xTechSearch, and Adranos was announced the winner of the Expeditionary Technology Search competition, March 28.

Adranos Flight Demonstration (Youtube)

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Thank you to our partners!
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